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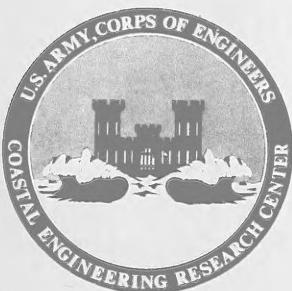
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# An Annotated Bibliography of Patents Related to Coastal Engineering

by

Robert E. Ray, Michael D. Dickey, and Annie M. Lyles

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<p>This report describes a collection of 2,468 coastal engineering patents issued by the U.S. Patent Office from 1967 to 1976, a bibliographical guide to the collection, and the use of the patents and search aids. Patent topics include coastal structures and structural components, structure protection and maintenance, construction methods and equipment, field research and survey instruments, hydraulic laboratory modeling equipment, marine pollution</p>			
(continued)			

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control apparatus, and ocean energy extraction devices. The bibliography is a separate limited-edition three-volume appendix to this report dividing the 10-year period into three parts. Each volume includes a list of patent titles and numbers and an index by keywords as well as the patent annotations.

## PREFACE

This report describes the preparation and use of a collection of patents on coastal engineering issued by the U.S. Patent Office from 1967 to 1976 and of an annotated bibliography of the collection. Preparation of the collection and bibliography was carried out under the coastal engineering research program of the U.S. Army Coastal Engineering Research Center (CERC). The bibliography, contained in three volumes, has been published as a limited-edition appendix to this report due to its large size.

The report and its appendix were prepared by Robert E. Ray, Hydraulic Engineer, with the assistance of Michael D. Dickey and Annie M. Lyles, Civil Engineering Technicians, under the general supervision of R.A. Jachowski, Chief, Coastal Design Criteria Branch, Engineering Development Division. A. Szuwalski and T.J. Lawler prepared the computer programs that generated the keyword index to the bibliography, and W.T. Whitt assisted in preparing the annotations.

The authors gratefully acknowledge the efforts of T.O. Maser, C.L. Pistorino, and other personnel of the Office of the Chief Counsel, Office of the Chief of Engineers, for their guidance in choosing a method of searching for patents, their provision of publications used in the search, including arranging loans from other service libraries, and their help in obtaining high-quality copies of patents from the U.S. Patent Office.

The collection may be extended to earlier and more recent patent if use of the collection by coastal engineers in the Corps justifies the effort. The topics of an expanded collection may cover a broad range, as in the present collection, or may be more limited, depending on the needs of the Corps. Inquiries and comments about this publication and the collection are invited.

Approved for publication in accordance with Public Law 166, 79th Congress, approved 31 July 1945, as supplemented by Public Law 172, 88th Congress, approved 7 November 1963.



TED E. BISHOP  
Colonel, Corps of Engineers  
Commander and Director

## CONTENTS

	Page
I INTRODUCTION . . . . .	7
II INFORMATION IN PATENTS . . . . .	9
III FINDING PATENTS . . . . .	11
IV PATENT SELECTION FOR THE COLLECTION . . . . .	14
V INDEXING THE COLLECTION . . . . .	17
1. The Keywords. . . . .	17
2. Assignment of Keywords to Patents . . . . .	29
VI THE BIBLIOGRAPHY . . . . .	29
1. Information in the Annotations. . . . .	29
2. Use of the Title List . . . . .	36
3. Use of the Subject Index. . . . .	36
VII SUMMARY . . . . .	44

## TABLES

1 Libraries having copies of the CERC patent bibliography . . . . .	8
2 Libraries having patent collections . . . . .	13
3 Patent classes searched . . . . .	15
4 Revised codes for "Hydraulic and Earth Engineering" from the <i>Manual of Classification of Patents</i> . . . . .	45

## FIGURES

1 Typical front page of a patent document . . . . .	10
2 Typical page from the <i>Manual of Classification of Patents</i> before 1979 revision . . . . .	12
3 Typical page from the <i>Official Gazette</i> . . . . .	16
4 Typical annotations for original patents issued before 1969 . .	31
5 Typical annotations for original patents issued since 1969. . .	32
6 Additional examples of annotations for original patents . . . .	33
7 Typical annotations for reissued patents. . . . .	34
8 Additional examples of annotations for reissued patents . . . .	35

## CONTENTS

### FIGURES--Continued

	Page
9 Notes on some of the reissued editions of original patents annotated in Volume II . . . . .	7
10 Page from title list of Volume III. . . . .	8
11 Page from subject index of Volume III . . . . .	9
12 Page from subject index of Volume I . . . . .	40
13 Annotations illustrating assignment of keywords . . . . .	42
14 Additional annotations illustrating assignment of keywords. . .	43



AN ANNOTATED BIBLIOGRAPHY  
OF  
PATENTS RELATED TO COASTAL ENGINEERING

by  
*Robert E. Ray, Michael D. Dickey, and Annie M. Lyles*

I. INTRODUCTION

A patent is a legal document defining an invention and granting the inventor control of the manufacture, use, and sales of the invention in the United States for 17 years. It is valuable both as a grant of rights to the inventor and as a source of new ideas and, in cases where laboratory or field testing was conducted before application for a patent, of information on the performance of an invention. By the end of 1976, the United States had issued over 4 million patents. Searching such a massive collection for patents in particular categories is difficult, and scientists and engineers have found that problems with the classification system make use of the collection prohibitively time consuming.

The Coastal Engineering Research Center (CERC) has collected patents issued between 1967 and 1976 that are related to the Center's fields of interest and the Corps of Engineers' responsibilities. The collection is located in the Center's library. A three-volume bibliographical guide to that collection has been prepared to simplify the searcher's task of finding needed patents. Each volume contains a list of the numbers and titles of the patents described in the volume, annotations giving information on each patent, and a subject index based on assigned keywords. The bibliography has been published as a separate appendix to this report and has been distributed only to the libraries listed in Table 1, but it may be ordered from the National Technical Information Service (NTIS). This report discusses the information in patents and the methods of searching a general collection of patents for information on a particular type of invention. It describes the search methods used to find patents for the CERC collection, the format of the CERC bibliography, and the methods of using the bibliography to find patents related to coastal engineering.

The Shore Protection Manual (SPM) (U.S. Army, Corps of Engineers, Coastal Engineering Research Center, 1977)<sup>1</sup> defines coastal engineering as "the application of the physical and engineering sciences to the planning, design and construction of works to modify or control the interaction of the air, sea, and land in the coastal zone for the benefit of man and for the enhancement of natural shoreline resources." The Corps' involvement in coastal engineering includes shore and beach restoration and protection, hurricane flood protection, construction and operation

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<sup>1</sup>U.S. ARMY, CORPS OF ENGINEERS, COASTAL ENGINEERING RESEARCH CENTER, *Shore Protection Manual*, 3d ed., Vols. I, II, and III, Stock No. 008-022-00113-1, U.S. Government Printing Office, Washington, D.C., 1977, 1,262 pp.

Table 1. Libraries having copies of the CERC patent bibliography.

<u>Corps of Engineers Libraries</u>	
Atlanta, Ga.	South Atlantic Division
Chicago, Ill.	North Central Division
Dallas, Tex.	Southwestern Division
Fort Belvoir, Va.	Coastal Engineering Research Center
Fort Shafter, Honolulu	Pacific Ocean Division
New York, N.Y.	North Atlantic Division
Portland, Oreg.	North Pacific Division
San Francisco, Calif.	South Pacific Division
Vicksburg, Miss.	Lower Mississippi Valley Division
Vicksburg, Miss.	Waterways Experiment Station
Waltham, Mass.	New England Division
Washington, D.C.	Office of the Chief of Engineers
<u>Other Federal Libraries</u>	
Alexandria, Va.	U.S. Naval Facilities Engineering Command
Arlington, Va.	Patent Office Scientific Library
Port Hueneme, Calif.	U.S. Navy, Civil Engineering Lab
Washington, D.C.	Library of Congress
<u>Public and University Libraries</u>	
Berkeley, Calif.	University of California Library
Boston, Mass.	Public Library
Chicago, Ill.	Public Library
Denver, Colo.	Public Library
Houston, Tex.	Fondren Library - Rice University
Los Angeles, Calif.	Public Library
New York, N.Y.	Public Library
Philadelphia, Pa.	Franklin Institute Library
Seattle, Wash.	Engineering Library - University of Washington
Stillwater, Okla.	Oklahoma State University Library

of navigation and recreation projects, the related control of water quality, conservation and enhancement of fish and wildlife in the coastal zone, and an interest in development of coastal electric power.

In general, the collection contains any water or earth control structure, and any large structures supported by piles, jackets, or the sea bottom, useful in the geographic area from tidal marshland and estuary to the Inner Continental Shelf. Related patents for seabed foundations and structural anchors, small-craft harbor structures, and fouling or corrosion prevention systems are presented. Also included are construction methods and equipment, emphasizing dredges and piledrivers. Inventions useful in coastal research, such as bathymetric and seismic survey systems, water and seabed soil samplers, instruments for measuring water and bottom properties, and laboratory flumes and wave generators, comprise part of the patent collection. Also presented are pollutant detection, control, and removal equipment for use in open water, and ocean energy extraction devices.

Although mining, transporting, and prospecting for offshore minerals are not subjects of direct interest to the Corps, many devices used in

those fields, from offshore mining equipment and pipeline trenchers to seabed storage tanks and jack-up drilling platforms, are included in the patent collection because of their relation to dredging, excavating, offshore harbors, and seabed foundations. Shipbuilding and loading structures, which fall into the fields of harbor and marine engineering, are not of specific interest to the Corps, but patents on small-craft harbor structures and methods for maintaining harbor navigation are also in the collection. The collection contains piles and pile-driving equipment of all types usable for work in the coastal region, not just those specifically used for offshore and harbor structures.

The collection is already in use at CERC, where researchers have, for example, used the bibliography to locate patents describing the operating principles of specific types of electronic wave gages, information not found in electronics texts or in manufacturers' literature. Requests from inventors and Corps offices for predictions of the behavior of newly patented, but untested, low-cost shore protection methods have been answered by searching the collection for patents on similar designs which had been used in the field. Patent attorneys within the Corps are using the subject index as an aid in searching the Patent Office's collection to determine the possibility of patenting devices developed by the Corps. Planners and designers in the Corps should find the CERC collection of patents useful as a source of data on new options in solving coastal engineering problems.

## II. INFORMATION IN PATENTS

Patents are issued each Wednesday, and all patents for the week bear the same date of issue. Since 1836, patents have been assigned reference numbers in a common sequence; thus, the four-millionth patent issued received the number 4,000,000. As illustrated in Figure 1, in addition to the patent number, title, date of issue, application number, and date of application, each patent document contains the name and address of the inventor and, if the inventor has granted patent rights to a company or another individual, of the assignee. The bulk of the patent consists of the figures and the text, comprising a broad description of the figures and the inventor's ideas, a numbered list of claims which delineate the specific ideas that the patent controls, and, if the patent's application was submitted after 1 January 1967, an abstract briefly summarizing the rest of the text. Corrections of typographical and other minor errors in a patent are noted on a "Certificate of Correction" included in document.

Each patent is assigned a set of U.S. and international classification codes used for filing the patent according to precisely defined topics. The U.S. classification system is revised periodically so the classification codes listed in the patent at the time of issue may not be the codes currently assigned to it. The patent codes represent an "original classification" best characterizing the patent, and "cross-reference classifications" which further describe aspects of the patent. The U.S. original classification code is printed on every patent. Patent documents have contained both U.S. cross-reference classification and international codes since December 1968. The *Manual of Classification of Patents* (Department of Commerce, Patent and Trademark Office,

**United States Patent** [19]  
Tazaki et al.

[11] **3,991,576**  
[45] Nov. 16, 1976

[54] **FLOATING BREAKWATER**

[75] Inventors: Sandanori Tazaki, Kodairo; Yozo Ishida, Kunitachi, both of Japan

[73] Assignee: Bridgestone Tire Company Limited, Tokyo, Japan

[22] Filed: Dec. 27, 1974

[21] Appl. No.: 536,783

**Related U.S. Application Data**

[62] Division of Ser. No. 398,368, Sept. 18, 1973.

[30] **Foreign Application Priority Data**

Sept. 19, 1972 Japan ..... 47-107980  
Sept. 30, 1972 Japan ..... 47-113640  
May 9, 1973 Japan ..... 48-54312

[52] **U.S. Cl.** ..... 61/5

[51] **Int. Cl.** ..... E02B 3/06

[58] **Field of Search** ..... 9/8 R; 61/1 F, 3, 4,  
61/5; 114/5 F

[56] **References Cited**

UNITED STATES PATENTS

436,644 9/1890 White ..... 61/5

1,933,597 11/1933 McVitty ..... 61/5 X  
2,658,350 11/1953 Magill ..... 61/5  
3,503,214 3/1970 Desty et al. ..... 61/1 F  
3,791,150 2/1974 Tachii ..... 61/5

*Primary Examiner*—Paul R. Gilliam

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*Attorney, Agent, or Firm*—Sughrue, Rothwell, Mion,  
Zinn and Macpeak

[57]

**ABSTRACT**

A floating breakwater in which the floating body is formed by housing a floating material as a floating source and a weighting material as a source for increasing weight in a hollow shell composed of a rigid material and provided with a projection on the upper portion. The specific gravity of the floating body is made to be 0.15 – 0.75 owing to the floating material and the weighting material.

1 Claim, 16 Drawing Figures

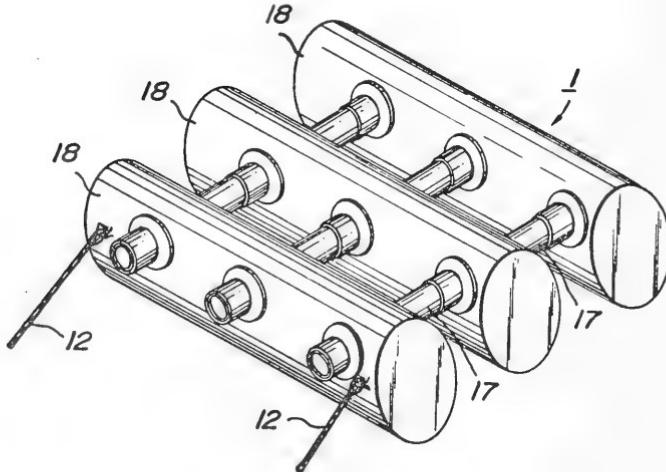


Figure 1. Typical front page of a patent document.

1975<sup>2</sup> gives explanations of the U.S. codes. Figure 2 shows a typical page from the manual. The U.S. Patent Office has available lists of all patent numbers presently referenced to each U.S. classification code by original or cross-reference classification.

The names of the inventor's attorney and the U.S. Patent Office examiner who reviewed the application are included in the patent, along with information on closely related patents discovered in their search. The number, date of issue, inventor, and original classification code of these patents are listed. Most patents issued since October 1970 also have a list of the classifications searched for the review.

Inventors make revisions to patents by having them reissued. Reissued patents are assigned reference numbers preceded by the abbreviation "Re." in a sequence separate from the original patents. The complete text of the original patent is in the reissue with deletions in brackets and additions in italics.

The format of patents was changed in 1970 to streamline the search process and prepare the documents for inclusion in a computer processable library. All of the above information, an abstract, and an exemplary figure are on the first page of the patent document as shown in Figure 1. Each data element on the page is identified with an internationally recognized numeric code for worldwide use of the information.

### III. FINDING PATENTS

Complete copies of all patents in the CERC collection are filed in numerical order in bound reference volumes in the CERC library. At the U.S. Patent Office Public Search Room, Crystal Plaza, 2221 Jefferson Davis Boulevard, Arlington, Virginia, all issued patents are filed both on microfilm in numerical order and in printed copies under their assigned classification codes (original or cross-reference). Table 2 lists the libraries in the United States that have patent collections open to the public. Copies of patents may be ordered by patent number for 50 cents apiece (1979) by writing the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Several methods of finding patents in desirable categories are available to the searcher. Patent attorneys and examiners with access to the Public Search Room commonly use guides to the patent classification system to pick the classification codes covering the types of inventions desired, then directly search the files under those codes. If the sole available collection is filed only in numerical order, the searcher obtains the Patent Office's lists of patent numbers assigned the chosen codes. Searchers who must keep a current record of patents in a particular technical field can subscribe to the *Official Gazette* (Department

<sup>2</sup>DEPARTMENT OF COMMERCE, PATENT AND TRADEMARK OFFICE, *Manual of Classification of Patents*, U.S. Government Printing Office, Washington, D.C., 1975 (Updated to 1979).

Original Classification 1918	
8. UNDERGROUND FLUID STORAGE	91 . . . With anchoring of structure to marine floor
1 R. WATER CONTROL	95 . . . By pivotal connection
1 F. . . Control of floating matter	96 . . . Sectional structure
2. Channels	97 . . . With auxiliary float chambers
3. . . Forming and preserving	98 . . . Including floor-engaging anchoring means
4. . . Jetties, groins and breakwaters	99 . . . Having floor-modifying means
5. . . Portable	100 . . . Including concrete placement
6. . . Fluid breakwaters	101 . . . Including storage containers
7. . . Canals	102 . . . With protecting or reinforcing structure
8. . . Locks	103 . . . Structure in or on frozen media
9. . . Lifting	104 . . . Including bollard means
10. . . Drainage	47 . . . Cribbing
11. . . Substratum	48 . . . Wharves
12. . . Irrigation	49 . . . Retaining wall type
13. . . Subirrigation	50 . . . Foundations
14. . . Flumes	51 . . . Underpinning
15. . . Sheet metal	52 . . . Pier
16. . . Culverts	53 . . . Piles
17. . . Intakes	53.5 . . . With cast-in-situ hardenable fluent material
18. . . Spillways	53.54 . . . With heating, cooling or explosion
19. . . Power	53.56 . . . With subsequent moving
20. . . Tide and wave	53.58 . . . Subsurface dispensing of material for flow toward surface
21. . . Fish ways	53.6 . . . Forming subsurface enlargement
22 R. Watergates	53.62 . . . Providing embedded metallic reinforcement
22 A. . . Sealing	53.64 . . . Dispensing fluent material while withdrawing dispenser
23. . . Uniform discharge	53.66 . . . Withdrawing form structure
24. . . Horizontally swinging	53.68 . . . Anchoring
25. . . Vertically swinging	53.7 . . . Driving removable wall supporting core
26. . . Overflow	53.72 . . . Diametrically retractable core
27. . . Collapsible	53.74 . . . Discharging fluid lubricant or jet
28. . . Sliding	54 . . . Protected
29. . . Removable	58 . . . Sheet-piling
30. . . Dams and levees	59 . . . Concrete
31. . . Cores	60 . . . Metallic
32. . . Hollow	61 . . . C and I sections
33. . . Tension stayed	62 . . . Head-and-claw interlock
34. . . Cofferdams	56 . . . Concrete
35. EARTH CONTROL	56.5 . . . Cast in situ
36 R. Solidifying or thawing earth	64 . . . DRYDOCKS
36 A. . . Heating or freezing	65 . . . Lifting
38 B. . . Chemical	66 . . . Keel and bilge blocks
36 C. . . Organic	67 . . . MARINE WAYS
36 D. . . Bituminous	68 . . . SHIP CAISSENS
37. . . Revetments	69 R . . . DIVING
38. . . Mattresses	69 A . . . Submarine attachment
39. . . Retaining walls	70 . . . Suits
40. . . Shafts	71 . . . Rigid elements
41 R. . . Shaft lining and excavation sheathing	105 . . . PIPE AND CABLE LAYING
41 A. . . Trench shoring	72.2 . . . Casting in situ
42. . . Tunnels	106 . . . With protection or indication of pipe or trench
43. . . Sectional	107 . . . Submerging line of pipe or cable
44. . . Subways	108 . . . Facilitated by extension from line-laying vessel
45 R. . . Tunnel lining	109 . . . With causing or controlling the deformation of a line
45 B. . . Roof bolts	110 . . . With assembling of line structure
45 C. . . Roof supports	111 . . . By joining successive section of line
45 D. . . Mobile props	112 . . . By control of buoyancy
45 F. . . Flexible or inflatable	113 . . . With anchoring of line
86. STABLE STRUCTURES IN SHIFTING MEDIA	114 . . . With raising of line from marine floor
87. . . Structure floatable to site and supported by marine floor	72.4 . . . Entrenched or buried
88. . . Supported by submersible base	
89. . . And legs depending from base	
90. . . Work deck vertically adjustable relative to floor	
91. . . By mechanical jack means or sectional legs	
92. . . By buoyancy control	
93. . . Deck structure horizontally movable or adjustable	

Figure 2. Typical page from the *Manual of Classification of Patents* before 1979 revision.

Table 2. Libraries having patent collections.

Albany, N.Y.	State University of New York Library
Atlanta, Ga. <sup>1</sup>	Price Gilbert Library
Birmingham, Ala. <sup>2</sup>	Georgia Institute of Technology
Boston, Mass.	Public Library
Buffalo, N.Y.	Public Library
Chicago, Ill.	Buffalo and Erie County Public Library
Cincinnati, Ohio	Public Library
Cleveland, Ohio	Public Library
Columbus, Ohio	Ohio State University Library
Dallas, Tex. <sup>1,2</sup>	Public Library
Denver, Colo. <sup>1,2</sup>	Public Library
Detroit, Mich.	Public Library
Houston, Tex. <sup>1</sup>	Fondren Library
Kansas City, Mo. <sup>1</sup>	Rice University
Lincoln, Nebr. <sup>1</sup>	Linda Hall Library
Los Angeles, Calif. <sup>1</sup>	Love Memorial Library
Madison, Wis. <sup>1</sup>	University of Nebraska
Milwaukee, Wis.	Public Library
Newark, N.J.	Wendt Engineering Library
New York, N.Y.	University of Wisconsin
Philadelphia, Pa.	Public Library
Pittsburgh, Pa. <sup>1</sup>	Franklin Institute Library
Providence, R.I.	Carnegie Library
Raleigh, N.C. <sup>1</sup>	Public Library
Seattle, Wash. <sup>1</sup>	D.H. Hill Library
St. Louis, Mo. <sup>1</sup>	North Carolina State University
Stillwater, Okla.	Engineering Library
Sunnyvale, Calif. <sup>3</sup>	University of Washington
Toledo, Ohio	Public Library
	Oklahoma State University Library
	Sunnyvale Patent Library
	Public Library

<sup>1</sup>Collection between 1967 and 1976 on microfilm only.

<sup>2</sup>Collections start in 1974 or 1976.

<sup>3</sup>Collection arranged by classification. All other collections are arranged numerically.

of Commerce, Patent and Trademark Office)<sup>3</sup>, a journal including summaries of each week's newly issued patents, listed by classification. They may also use the publications of organizations that search the *Official Gazette* to abstract patent information from classifications selected by the user. Computer-based record systems allowing sorting by classification codes or by keywords are available for parts of the classification system. Publications indexing patents by topics, such as the CERC Bibliography and the earlier *Oceanic Patents 1959-1968* (Sinha, 1969)<sup>4</sup>, exist for some technical fields.

#### IV. PATENT SELECTION FOR THE COLLECTION

The organization of the Patent Office's classification system did not match the categories of subjects related to coastal engineering; therefore, available aids using that system could not be used alone to find patents for the CERC collection. When writing the claims in their patents, inventors describe the function of their invention in the broadest possible terms, while being more explicit in describing the principles of operation and construction. Following this pattern, the classification system is organized in a hierarchy under functional headings. The heading might be a general "class," symbolized by the first number in a classification code, or a subordinate, more specific "sub-class," represented by the second code number. Some functional headings, such as subclass 54, "Dredgers," under class 37, "Excavating," were applicable to coastal engineering and the classification code, in this case 37-54, could be used directly to find interesting patents. In other cases the heading was a class or a general subclass and each patent classified under it had to be inspected. For example, patents for methods of removing marine pollutants were interspersed among those for straining soup under class 210, "Liquid Purification or Separation." This situation required the use of a combination of search methods.

As a first step in organizing a selection process, the *Manual of Classification* was used to choose the functional classifications most closely related to the coastal engineering categories. Several *Official Gazettes* were then reviewed thoroughly and the classification codes of interesting patents noted. The result was the list of classes and corresponding code numbers given in Table 3. Due to the length and generality of the list, use of the files in the Public Search Room was impractical so the *Official Gazettes* were searched with special emphasis on the classes in the list. Figure 3 shows a typical page from an *Official Gazette*. If the information in the *Official Gazette* was insufficient to determine whether an invention was useful for coastal engineering, a copy of the patent was ordered and examined before making a final decision on its selection.

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<sup>3</sup>DEPARTMENT OF COMMERCE, PATENT AND TRADEMARK OFFICE, *Official Gazette*, Washington, D.C., issued weekly.

<sup>4</sup>SINHA, E., *Oceanic Patents 1959-1968*, Ocean Engineering Information Series, Vol. 1, Ocean Engineering Information Service, La Jolla, Calif., 1969.

Table 3. Patent classes searched.

<u>Class code</u>	<u>Class title</u>
9	Boats, Buoys, and Aquatic Devices
14	Bridges
35	Education
37	Excavating
43	Fishing, Trapping, and Vermin Destroying
52	Static Structures, e.g., Buildings
60	Power Plants
61	Hydraulic and Earth Engineering
73	Measuring and Testing
94	Roads and Pavements
102	Ammunition and Explosive Devices
114	Ships
115	Marine Propulsion
117	Coating: Processes and Miscellaneous Products
137	Fluid Handling
141	Fluent Material Handling, with Receiver or Receiver Coacting Means
166	Wells
172	Earth Working
173	Tool Driving or Impacting
174	Electricity, Conductors, and Insulators
175	Boring or Penetrating the Earth
181	Acoustics
182	Fire Escapes, Ladders, Scaffolds
185	Motors, Spring, Weight, and Animal Powered
204	Chemistry, Electrical and Wave Energy
210	Liquid Purification or Separation
214	Material or Article Handling
239	Fluid Sprinkling, Spraying, and Diffusing
249	Static Molds
250	Radiant Energy
252	Compositions
253	Motors, Fluid
264	Plastic and Non-Metallic Article Shaping
290	Prime-Mover Dynamo Plants
299	Mining or In Situ Disintegration of Hard Material
302	Conveyors, Fluid Current
324	Electricity, Measuring, and Testing
340	Communications, Electrical
356	Optics, Measuring, and Testing
415	Rotary Kinetic Fluid Motors or Pumps
417	Pumps

3,849,988

**COMBUSTION CHAMBERS FOR INTERNAL  
COMBUSTION ENGINES EQUIPPED WITH A  
TURBO-COMPRESSOR UNIT WITH REHEATING  
UPSTREAM OF THE TURBINE**

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Int. Cl. F02b 3/04

U.S. CL. 60—606

21 Claims

Table 3 is presented only for the information of users familiar with the Patent Office classification system. The table does not include all of the classifications assigned to patents in the collection, just those classes examined most closely. The subclasses searched were too numerous to list. Patent attorneys and examiners using the bibliography for patent searches must realize that the criteria for patent selection were primarily functional, cutting across the Patent Office's classification system, so that the bibliography cannot be used to find all of the patents referenced to a particular classification code.

## V. INDEXING THE COLLECTION

### 1. The Keywords.

Since the Patent Office classification system could not be used to catalog the CERC collection, a system of keywording was developed as the basis for an index. The assignment of a keyword to each of the numerous detailed categories of inventions in the collection was impractical, consequently, as the following guide to the keyword system demonstrates, a keyword may cover several categories, including some unobvious ones. The following are not definitions of terms in the strictest sense but rather explanations of the topics included under each keyword, and taken as a whole, a list of all of the collection's topics.

ARTIFICIAL SEAWEED - Strands of synthetic material placed underwater in clumps or blankets to control scour.

ASPHALT - Bituminous material used as a binder or coating.

BAR PROTECTION - Formation or preservation of a bar or reef.

BATHYTHERMOGRAPH - A device for measuring the change of water temperature with depth, including air temperature just above the water surface.

BREAKWATER, CONCRETE - A concrete structure protecting a shore area, harbor, anchorage, or basin from waves, including large caissons and small low-cost units.

BREAKWATER, FLOATING - Moored buoyant units for protecting harbors and shore areas from wave attack.

BREAKWATER, PNEUMATIC - A bubble curtain for wave dissipation.

BREAKWATER, RUBBLE - A mound of soil or random-shaped and random-placed stones protected with a cover layer of selected stones or specially shaped concrete armor units, including structure cross sections useful as groins or jetties if the function was not specified in the patent.

BREAKWATER, STEEL FRAME - A wave-dissipating steel maze or a solid barrier of sunken ship sections or of steel caissons.

BULKHEAD - A structure or partition to retain or prevent sliding of the land. A secondary purpose is to protect the upland against damage from wave action.

BUOY MOORING SYSTEM - A method of anchoring a buoy or of fastening instruments to the anchor lines of a buoy.

BUOY, INSTRUMENTED - A buoy equipped with oceanographic instruments.

CATHODIC PROTECTION - Prevention of the corrosion or fouling of steel structures by electrical means.

CHANNEL BARRIER - A structure restricting tidal flow to permit energy production, storm protection, navigation, or water quality control.

CHANNEL PROTECTION - Control of siltation in harbors and navigation channels by means of structures or stationary dredging plants.

COATING - A protective paint, film, or covering or a method of application.

COFFERDAM - A temporary barrier allowing repair or construction of coastal structures under dry conditions.

COLLISION PROTECTION - Prevention of direct impact between ships and coastal structures.

CONCRETE ARMOR UNIT - A concrete object usually shaped to interlock, used in a protective outer layer on a coastal structure.

CONCRETE BLOCK - A concrete block used for coastal structures, usually a form of paving block used in revetments or of structural block used in seawalls.

CONCRETE FORM - A stationary or movable mold for concrete or grout.

CORROSION MEASUREMENT - Measurement of corrosion for research or control of cathodic protection systems.

CORROSION PREVENTION - Protection of metal coastal structures against corrosion damage.

CURRENT MEASUREMENT - Measurement of ocean or tidal current velocity or direction.

DEPTH PRESSURE MEASUREMENT - Determination of depth by measuring water pressure, usually to measure wave or tidal height or to control the depth of towed bodies.

**DREDGE INTAKE** - The sediment-gathering part of a dredge, including suction and cutterheads and the digging end of bucket ladders, but excluding seabed mining apparatus for sorting dredged sediment by size. When used with DREDGE PROPULSION, signifies that the intake is propelled independently of the dredging vessel. When used with PUMP, signifies that the intake includes a submerged pump.

**DREDGE LADDER CONTROL** - A mechanism or method of controlling the position of dredge bucket chains, ladders, and suction arms, including wave compensation devices.

**DREDGE PIPE** - Pipe for conveying dredge spoil, including flexible joints and floats.

**DREDGE PROPULSION** - A means of moving a dredge, including apparatus for placing spuds.

**DREDGE-SPOIL MEASUREMENT** - Determination of spoil concentration or volume, usually for control of the rate of dredging.

**DREDGE-SPOIL TRANSPORT** - A means of loading or unloading hopper barges or dredges, pumping spoil to a disposal site, or placing beach or land fill.

**DREDGE, CUTTERHEAD** - A suction dredge with a mechanical cutter.

**DREDGE, MECHANICAL** - A bucket ladder, bucket chain, dragline, grab, clamshell, or dipper dredge.

**DREDGE, SUBMERGED** - A dredge with pump, propulsion, and control means underwater, usually supported by the seabed, excluding seabed mining apparatus for sorting dredged sediment by size.

**DREDGE, SUCTION** - A plain suction, dustpan suction, or trailing suction dredge, with no mechanical excavating equipment.

**DUNE PROTECTION** - Formation or preservation of dunes or dikes.

**ELECTRICAL GENERATOR** - A source of electrical power.

**EMBEDMENT ANCHOR** - A propellant-actuated or vibration-driven plate anchor, a screw anchor, a driven or drilled-in-place anchor pile, or means for installing such anchors.

**FABRIC MAT** - A double-layered mattress of woven or nonwoven fabric or plastic film filled with sand or used as a form for grout or concrete, a single layer of such material used as filter cloth, or a web of synthetic material used to dissipate wave motion over a surface.

**FOULING PREVENTION** - Protection of coastal structures, including seawater intakes, against incrustation with marine organisms.

**FOULING REMOVAL** - Incrustation removal from watercraft.

**GABION** - A metal cage filled with rock and interconnected with others to form a revetment or bulkhead.

**GROIN** - A shore protection structure built on the bottom or suspended in the water at an angle to the shoreline to trap littoral drift or retard erosion of the shore.

**GROUTING** - Grout placement to underpin a coastal structure, to anchor a pile in the bottom or in a structure leg, or to seal a structure.

**HOPPER BARGE** - A barge or scow for transporting spoil or refuse, including bottom-dump barges and hopper dredges.

**HYDRAULIC MODEL BASIN** - A facility using three-dimensional wave or tide motion for educational demonstrations or model testing.

**ICE PROTECTION** - Prevention of damage to coastal structures by collision with floating floes or bergs, or by crushing or uplift by surrounding sheet ice.

**ICE STRUCTURE** - An offshore island of frozen material or a protective barrier of ice around an offshore structure.

**INSTRUMENT, LASER** - An oceanographic instrument using collimated beams of radiation.

**INSTRUMENT, RADIOISOTOPE** - An instrument using high-energy radiation, including means of measuring the radioactivity of samples, for handling irradiated sediment samples for tracer studies, or for X-ray photographing members of coastal structures.

**INSTRUMENT CABLE** - Waterproof power or data transmission cable for oceanographic instruments.

**INSTRUMENT DEPLOYMENT** - Placement of instruments or samplers at predetermined depths or locations using, for example, automatic depth-changing vehicles, free-fall probes, or buoy mooring cables.

**INSTRUMENT POWER SUPPLY** - A means of producing or delivering power to an instrument.

**INSTRUMENT RETRIEVAL** - Location and recovery of instruments, records, or samples.

**INSTRUMENT, AIRBORNE** - A remote-sensing instrument mounted in a tower, aircraft, or spacecraft, or a direct-measurement instrument in a projectile launched through the air.

**OFFSHORE ISLAND** - A manmade island of rubble, ice, or fill.

**OFFSHORE MOORING STRUCTURE** - An unprotected structure for mooring ships in the open sea, including buoys with patented anchoring systems, bottom-supported mooring platforms, and docks for service boats on offshore drilling platforms. Does not include mooring buoys without new anchoring systems.

**OFFSHORE PLATFORM ANCHOR** - An anchoring means specifically for resisting the uplift or lateral motion of a buoyant offshore structure.

**OFFSHORE PLATFORM, FIXED** - A platform founded in the bottom and supported by rigid legs.

**OFFSHORE PLATFORM, FLOATING** - A floating drilling or mooring platform with patented anchoring system. When used with OFFSHORE PLATFORM, FIXED or OFFSHORE PLATFORM, JACK UP, signifies that the platform either is moored to a fixed platform or is semisubmersible and may be sunk until supported by the bottom in shallow water.

**OFFSHORE PLATFORM, JACK UP** - A platform equipped with vertically movable legs that are lowered to the bottom to support the working deck above the water's surface, including devices for changing the vertical position of the legs.

**INSTRUMENT, SEABED IN SITU** - An instrument placed in or on the bottom for measuring the seabed's mechanical, electrical, or chemical properties in place.

**INSTRUMENT, TOWED** - Any oceanographic instrument towed through the water or across the bottom, except seismic surveying gear.

**JETTY** - A structure extending into a body of water at the mouth of a river or tidal inlet, designed to help deepen and stabilize a channel by preventing shoaling by littoral material and by directing and confining the stream or tidal flow.

**LOW-COST SHORE PROTECTION** - A shore protection structure, such as a revetment, seawall, or breakwater, that a private landowner can construct to protect beach-front property.

**OFFSHORE CAISSON** - A large hollow structure placed seaward of the breaker zone, including, for example, modular units for breakwaters, oversize legs for platforms, and rigid pollution barriers around platforms.

**OFFSHORE CONSTRUCTION** - Assembly of a coastal structure on or under the water's surface and placement of a structure on or in the bottom. Does not include means of transporting the structure to the construction site.

**OFFSHORE HARBOR** - A manmade structure not connected with the shore, forming an enclosure for mooring and protecting ships.

OFFSHORE PLATFORM, LEG - A support for the working deck of a fixed, floating, or jack-up platform.

OFFSHORE PLATFORM, WALKING - A platform that can be moved horizontally while supported by the bottom, including devices for changing the horizontal position of the legs.

OFFSHORE STORAGE TANK, EMERGENT - A tank with at least one storage chamber above or piercing the water's surface.

OFFSHORE STORAGE TANK, SUBMERGED - A tank with all storage chambers underwater, in some cases including an attached mooring and service structure protruding above the surface.

OFFSHORE STRUCTURE FENDER - A device for preventing or absorbing the impact between an offshore structure and ships, ice, or debris.

PIER FENDER - A device for absorbing the impact between a dock structure and a watercraft.

PIER, FIXED - A recreation or dock structure rigidly supported by piles or legs on the bottom or cantilevered out from the shore.

PIER, FLOATING - A dock structure supported by its buoyancy.

PIER, MOBILE - A fixed or floating dock structure designed to be dismantled, moved, and reassembled easily.

PILE DOLPHIN - A freestanding pile or cluster of piles, usually used in a harbor, designed to absorb impacts with watercraft.

PILE DRIVER LEADS - Guides for a pile or hammer, including means for controlling batter.

PILE DRIVER, IMPACT - A means of driving a pile by a succession of impacts, including drop hammers, steam hammers, and diesel hammers.

PILE DRIVER, VIBRATORY - A means of driving a pile by vibrating the pile at a resonant frequency, including "sonic drivers" and rotated eccentric weights.

PILE DRIVER, WATER JET - A means of driving a pile, or aiding other methods of pile driving, by using a jet of fluid to remove material below the pile.

PILE-DRIVING SHOE - A cutting shoe used at the bottom of concrete, wood, or thin steel piling to aid driving.

PILE EXTRACTOR - A means of removing a pile from the earth.

PILE FOOTING - A means of increasing a pile's bearing capacity by increasing the diameter of the bearing area in the surrounding soil.

**PILE LOAD MEASUREMENT** - Determination of pile capacity, driving resistance, or lateral load.

**PILE PLACEMENT** - Positioning piles for underwater driving or arranging piles in a specified pattern.

**PILE PROTECTION** - Prevention of damage to piles by ice, fouling, corrosion, or impact.

**PILE SECTION CONNECTION** - A means of splicing lengths of pile or joining adjacent sheet piling.

**PILE, CONCRETE** - A long concrete column placed in the ground or seabed as a support for an elevated deck or a foundation member, including cast-in-place piles, when specified for marine use, or any type of precast concrete pile or concrete-filled steel pipe pile.

**PILE, SHEET** - A pile with a generally slender flat cross section to be driven into the ground or seabed and meshed or interlocked with like members to form a diaphragm wall, cofferdam, or bulkhead. Pile material is signified by **PILE, CONCRETE**; **PILE, STEEL**; or **PILE, WOOD**.

**PILE, STEEL** - A long steel column placed in the ground or seabed as a support for an elevated deck, a foundation member, or a part of a protective barrier, including thin shell piles when specified for marine use, or any type of H or steel pipe piles.

**PILE, STRUCTURE CONNECTION** - A means of joining a pile to the structure it supports, for example, a pier deck or offshore platform jacket.

**PILE, WOOD** - A long timber column placed in the ground or seabed as a support for an elevated deck or a foundation member.

**POLLUTANT ABSORPTION** - Removal of liquid pollutants from the water's surface by absorbing them into a porous material or by adsorbing them onto a surface, the material or surface being in the form of particles, belts, or mats.

**POLLUTANT BURNING** - Control of combustion of floating liquid pollutants, either to encourage removal by burning or to extinguish accidental fires.

**POLLUTANT COALESCENCE** - Chemical treatment of a floating liquid pollutant to change its consistency, as a means to limit its spread, shrink the area of its slick, or aid removal of it from the water's surface.

**POLLUTANT COLLECTION** - Concentration of pollutants by mechanical means before removal from a body of water, including the use of inverted funnels to collect leakage from the seabed, of towed surface barriers to collect slicks, and of various forms of weirs or sluice gates to concentrate floating pollutants in collection barges.

**POLLUTANT DEBRIS** - Floating solid objects to be removed or excluded from an area.

**POLLUTANT DISPERSION** - Chemical treatment of a floating liquid pollutant to break up its slick and cause it to become emulsified with water.

**POLLUTANT MEASUREMENT** - Detection, identification, sampling, or measurement of marine pollutants, such as oil slicks, turbidity, or gases, by field equipment.

**POLLUTANT REMOVAL WATERCRAFT** - A navigable craft, usually a barge, equipped with apparatus for removing marine pollutants.

**POLLUTANT, MECHANICAL REMOVAL** - Removal of pollutants from the surface of a body of water by the use of rotating drums, conveyors, belts, or scoops.

**POLLUTANT, SUBMERGED BARRIER** - A barrier preventing the spread of pollutants from submerged leaks.

**POLLUTANT, SUCTION REMOVAL** - Removal of pollutants by pumping them directly from the surface of a body of water or from a collection barge, including the use of weirs to control the intake flow.

**POLLUTANT, SURFACE BARRIER** - A barrier preventing the spread of floating pollutants, usually a floating boom.

**POWER, SUBMERGED SOURCE** - A means of extracting power from ocean currents or from pressure or thermal gradients to drive electrical generators or samplers.

**POWER, TIDE** - A means of extracting power from impounded tidal flow, tidal currents, or the tidal rise and fall of the water's surface to drive electrical generators, pumps, or mechanical devices.

**POWER, WAVE** - A means of extracting power from wave motion to drive electrical generators, pumps, mechanical devices, or instruments.

**PUMP** - A means of moving a fluid or slurry under pressure, usually part of a dredge or means of extracting power from the ocean.

**REVESTMENT** - A facing of stone, concrete blocks, grout-filled fabric mats or bags, or other material, built to protect a scarp, embankment, or shore structure against erosion by wave action or currents.

**SALINITY MEASUREMENT** - Determination of the salinity, conductivity, or acidity of water by field equipment.

**SAMPLER, BIOTA** - A means of collecting specimens of sea plant or animal life.

**SAMPLER, POWER SUPPLY** - A source of thrust for samplers such as driven or drilled corers, including explosives, vibratory devices, or implosive hydrostatic pressure chambers.

**SAMPLER, SEABED-DRILLED CORE** - Drilling apparatus taking sediment core samples from the seabed, usually coring bits with retainers for soft or granular material.

**SAMPLER, SEABED-DRIVEN CORE** - A means for taking sediment core samples from the seabed by thrusting a coring tube or box into the bed, using a propulsive device or the kinetic energy of a free fall to drive the corer.

**SAMPLER, SEABED GRAB** - A means of taking a disturbed surface sample from the seabed.

**SAMPLER, SURFACE** - A means for sampling matter, usually pollution or biota, floating on or near the water's surface.

**SAMPLER, SUSPENDED SEDIMENT** - A means for capturing samples of sediment suspended in or falling through water.

**SAMPLER, WATER** - A container taking a water sample at a preselected depth.

**SANDBAG** - A bag or tube of fabric or plastic film filled with sand, grout, or concrete to seal, underpin, or serve as a structural unit in a coastal structure.

**SAND FENCE** - A barrier for trapping windblown sand to prevent erosion and promote formation of dunes.

**SEABED CABLE PLOW** - A plow-shaped device for burying cable or flexible pipe in the seabed without excavating a trench.

**SEABED FOUNDATION** - A structure on or in the seabed for supporting a superstructure, such as oil- or water-process equipment, an offshore platform, a storage tank, or a breakwater.

**SEABED GRADER** - A remote-controlled submersible bulldozer or similar equipment for leveling a seabed site.

**SEABED MATERIAL PLACEMENT** - Placement of materials such as concrete, asphalt, sand, gravel, grout, or turbidity-reducing agents on the seabed as a layer or in a form.

**SEABED OIL, PROCESS STRUCTURE** - A structure fixed to the seabed for supporting or protecting submerged drilling, completion, or production equipment such as wellheads or gas-separation units.

**SEABED PIPELINE PLACEMENT** - Anchoring or burying a pipeline in the seabed, excluding methods for laying the pipeline itself from barges.

**SEABED PROPERTY MEASUREMENT** - Determination of seabed soil properties, such as bearing capacity, consolidation, specific gravity, or chemical composition, by measuring other properties, such as resistance to impact, sound transmission, electrical resistance, or radioactivity.

**SEABED SCOUR PROTECTION** - Prevention of the removal of underwater material at the base or toe of a coastal structure by waves and currents.

**SEABED SITE SURVEY** - A method of making a detailed survey of a small area, such as a construction site.

**SEABED SOIL TREATMENT** - Chemical or mechanical treatment of soil in the seabed to improve its qualities as construction or foundation material.

**SEABED TRENCHER** - A remote-controlled submersible excavator for forming trenches in the seabed, including towed units for burying pipeline.

**SEABED WATER, PROCESS STRUCTURE** - A structure fixed to the seabed for transporting or storing water, including cooling water intakes, sewer outfalls, or sewage storage tanks.

**SEAWALL** - A structure separating land and water areas, primarily designed to prevent erosion and other damage due to wave action.

**SEDIMENTATION MEASUREMENT** - Determination of sediment movement or accumulation, including tracer studies or the measurement of thin bottom layers.

**SEISMIC ACOUSTIC TRANSMITTER ARRAY** - A grouping of underwater seismic impulse sources, sometimes mounted in a three-dimensional framework.

**SEISMIC EXPLOSIVE ACOUSTIC TRANSMITTER** - An underwater seismic impulse source using a sudden discharge of pressure generated by igniting dynamite or a gas mixture, emitting a gas bubble, or producing an electric arc.

**SEISMIC HYDRAULIC ACOUSTIC TRANSMITTER** - An underwater seismic impulse source using the compression and flow properties of water to produce signal-generating water-hammer or turbulence effects.

**SEISMIC HYDROPHONE** - A single receiving unit for underwater seismic use.

**SEISMIC HYDROPHONE ARRAY** - A grouping of underwater seismic receivers, including one-dimensional arrangements within a streamer cable or three-dimensional arrangements of streamer cables or of hydrophones in a framework.

**SEISMIC IMPLOSIVE ACOUSTIC TRANSMITTER** - An underwater seismic impulse source using the sudden retraction of a piston or the collapse of a bubble of steam for implosion generation.

**SEISMIC RECORD PROCESSOR** - An electronic device for recording, deciphering, or printing signals from underwater seismic receivers.

**SEISMIC STREAMER CABLE** - A linear array of hydrophones attached to a towing cable, protective sheathing, and means for controlling the array's position.

**SEISMIC SURVEY METHOD** - A method of organizing and operating the components of an underwater seismic surveying system to use the equipment in different water depths or to detect features at specific depths in the seabed, including altering the instrument locations in a survey team's boats, the streamer cable arrangements, or the sequences of firing and recording cycles.

**SEISMIC VIBRATORY ACOUSTIC TRANSMITTER** - An underwater seismic signal source using an electrically, pneumatically, or hydraulically actuated vibrating transducer.

**SLOPE PROTECTION** - Stabilization of the faces of banks, dikes, or dunes to prevent sliding or erosion from runoff, including terracing or placement of mats, filter cloth, or other revetment materials.

**SMALL-CRAFT LAUNCHER** - A means for transferring watercraft to the water from storage on land and vice versa, including ramps, booms, or hoists.

**SMALL-CRAFT MOORING DEVICE** - A device for securing a watercraft in place in a harbor or dock, including mooring buoys, dock cleats, tie-off arrangements, or fender designs.

**SMALL-CRAFT PIER** - A fixed or floating dock structure for use in a small-craft harbor.

**SMALL-CRAFT SERVICE STRUCTURE** - A structure for storing or servicing small craft, including storage racks, drydocks, hull cleaning equipment, or sewage collection systems.

**SONAR, DEPTH SOUNDER** - A device or method using sound or light waves to determine the depth, and, in some cases, character of the seabed, and an associated piece of bathymetric mapping equipment, such as a recorder.

**SONAR, SIDE LOOKING** - A depth-measuring device or method using sound waves projected to the side of the survey track, at an oblique angle to the bottom, to detect the relief of the seabed, and, in some cases, associated equipment for producing bathymetric contour maps.

**STRUCTURE INSPECTION** - Detection of damage to coastal structures, including the X-ray photography or sonography of piles or platform legs to detect fouling, corrosion or fatigue damage, or the surveying of rubble structures to detect the removal of material.

STRUCTURE REPAIR - Correction of damage to coastal structures, in most cases replacement of damaged sections of a pile.

TIDAL ESTUARY WATER LEVEL - Control of tidal flow and water elevation in the part of a river affected by tides to permit navigation, energy production, or storm protection.

TIDAL ESTUARY WATER QUALITY - Control of tidal flow in the part of a river affected by tides to restrict the upstream movement of saltwater or to flush polluted water from stagnant parts of the estuary.

TIDAL INLET - Coastal structures that may be used in the short waterway between a tidal bay or lagoon and the parent body of water or at the mouth of a river where it flows into a large tidal body of water.

TIDAL MEASUREMENT - Determination of tidal height, current velocity, and period.

TIRES - Scrap tires used as structural units in coastal structures such as floating breakwaters or revetments.

TOW WINCH CONTROL - Operation of a tow winch to launch, retrieve, or control the depth of a towed instrument.

TOWED BODY DEPTH CONTROL - Operation of position control devices on towed instruments which, for example, regulate buoyancy of seismic streamer cables or manipulate diving planes on towed vehicles.

TOWED VEHICLE - A body containing or attached to a towed instrument to provide streamlining or buoyancy, or to control position, acceleration, or vibration.

TOWING CABLE - Cable for towing instruments, usually equipped with electrical conductors and fairings.

WATER PLANT REMOVAL - Removal of shallow-water weeds, to improve navigation or recreation in a body of water, by cutterhead dredges with special apparatus for cutting and shredding plants or by plant-harvesting watercraft with digging jets for uprooting plants and conveyors for removing them from the water.

WAVE ABSORBER BEACH - A wave-absorbing barrier or mattress to be placed in a model basin or on a beach face, a typical mattress being of loosely woven or perforated material which, unlike a revetment, does not cover the whole area with durable material.

WAVE FLUME - A facility using wave motion for research, educational demonstrations, or recreational activities.

WAVE GENERATOR - A means for making waves in a flume or model basin.

WAVE MEASUREMENT - Determination of wave height, force, period, and direction using, for example, stationary electronic or pressure gages, acceleration-measuring buoys, or remote-sensing radar or sonar equipment.

WIND MEASUREMENT - Determination of wind velocity and direction near the sea surface, including the use of anemometers on instrumented buoys.

WOOD PRESERVATIVE - A treatment for preventing rot or fouling damage to wood used in the coastal zone.

## 2. Assignment of Keywords to Patents.

The keywords were defined using the "Glossary of Terms" in Volume III of the SPM as a guide, and were assigned consistently to all patents having, according to the SPM definitions, the same functional properties. In many cases this practice led to the assignment of keywords that conflicted with the patent title. As an example, in coastal engineering a jetty is technically a barrier built at an inlet to prevent shoaling at a harbor entrance by channeling tidal flow and retarding sand movement along adjacent beaches. The term is also commonly used to describe a groin, a similar structure designed to hold or accumulate sand on a beach to prevent erosion. For this collection, a patent titled "jetty," but describing a shore protection structure, was keyworded "groin" not "jetty." Problems also arise when foreign technical terms are translated into English. For instance, in many French patents, such as patent 3,849,990 described on the example page in Figure 3, the term "heave" is used for "surf" or "waves."

Selecting keywords for the patents involved a compromise between keeping the subject index a manageable size and making it thorough. To focus attention on just the major points in each patent, words were picked which described the contents of first, the claims, and second, the other parts of the text. Problems were encountered whenever an inventor proposed a design for an entire system, then included only a small component in the claims. An example is a patent which described in detail a design for a floating small-craft pier while just the fenders were covered by the claims. Besides "pier fender," the keywords "pier, floating" and "small-craft pier" were added to represent the material in the text. Since only the claims may be of interest to patent attorneys and examiners, and the rest of the text may be valuable to engineers as an explanation of the claims and as general technical material, the indexing system, based on both the claims and the text, will provide more patents than may be useful in researching a patent application, but less than all that may be of value in searching for literature.

## VI. THE BIBLIOGRAPHY

### 1. Information in the Annotations.

Volume I of the appendix includes the annotations for selected patents 3,295,231 to 3,551,369, issued during the years 1967 to 1970. Volume II

covers patents 3,552,131 to 3,781,778 and reissued patents Re. 27,090 to Re. 27,640, issued during 1971 to 1973. Volume III includes patents 3,782,127 to 3,999,566 and reissued patents Re. 28,232 to Re. 28,989, issued from 1974 to 1976. Example annotations are presented for original patents in Figures 4, 5, and 6, and for reissued patents in Figures 7 and 8. Figure 4 is a page from Volume I containing annotations for patents issued on November 5 and 12, 1968. Figures 5 and 6 are pages from Volume II of the appendix with annotations from the dates shown in the figures. Figures 7 and 8 are pages from Volume III of the appendix containing annotations for reissued patents, including reissued versions of two of the original patents described in Figures 5 and 6.

As illustrated, annotations for new patents are listed in numerical order, grouped by the weekly date of issue. Each annotation includes information identifying the patent and inventor, classifying the patent, and briefly describing the invention. The patent number, the title, and information on the inventor, assignee, patent application, classification, and number of claims were copied directly from the *Official Gazette*, unless obvious spelling errors made the title confusing, or a "Certificate of Correction" with the patent document indicated that printing errors in the inventor's name needed to be corrected. As can be seen by comparing Figures 4 and 5, the format changes slightly between 1968 and 1969. Before 1969 the "original U.S. classification" is printed in parentheses after the abbreviation "C1." For 1969 and the following years the parentheses are deleted, the abbreviation "U.S. C1." is used, and all the assigned international classifications are listed after "Int. C1." "Cross-reference U.S. classifications," listed after the abbreviation "U.S. C1. X.R.," are added to the annotations for those patents assigned them from December 10, 1968, onward. All classification codes are those assigned to the patents at the time of issue and do not reflect changes caused by revisions in the classification system.

The description of the invention includes the abstract or, if the patent had no abstract, a representative claim with the claim number, copied from the *Official Gazette* or patent with no corrections of printing errors. The annotation at the top in Figure 4 illustrates the use of a claim. In addition, for those patents containing figures, a figure copied from the *Official Gazette* is included. As shown in the annotation at the top of Figure 4, if the patent contains no figures the fact is noted in the annotation. Another item in the annotation is the keywords assigned to each patent for this bibliography. If the patent was reissued before the end of 1976, a reference to the reissued patent number also is included in the annotation, as illustrated by the annotations at the top of Figure 5 and at the bottom of Figure 6.

Annotations for reissued patents are listed after the original patents in Volumes II and III. No reissued patents were chosen for the collection from the period covered by Volume I. Due to the small number of reissued patents, the date of reissue for each is given in the annotation, along with information on the original patent and on the application for reissue. If the original patent had an abstract, the entire text of the abstract is

3,409,525

PROCESS FOR REDUCING CORROSION

Charles W. Taylor, Jr., Akron, and Daniel T. Conrad, Cuyahoga Falls, Ohio, assignors to The Goodyear Tire & Rubber Company, Akron, Ohio, a corporation of Ohio

No Drawing. Filed May 24, 1965, Ser. No. 458,436  
8 Claims. (Cl. 204—147)

1. In the cathodic process of protecting ferrous articles from corrosion the improvement which comprises subjecting a ferrous article to a treatment that forms a phosphate coating on the surface of the article, then coating it with a fused resin, and then cathodically protecting said article.

Keywords: Cathodic protection; Corrosion prevention

No Figure

3,409,871

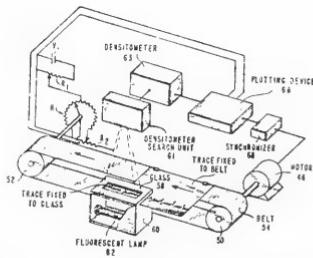
ELIMINATION OF MULTIPLE EVENTS ON SEISMOGRAMS OBTAINED AT WATER-COVERED AREAS OF THE EARTH

Harland H. Hefring, Calgary, Alberta, Canada, assignor to Esso Production Research Company, a corporation of Delaware

Filed Oct. 12, 1966, Ser. No. 586,075  
7 Claims. (Cl. 340—15.5)

Ringing events are eliminated from a trace of a reproducible seismogram taken at marine locations by adjustably attenuating electrical signals produced from a trace, delaying the trace by an amount equal to the seismic wave travel time through the water layer beneath the source, and adding the original signal to the undelayed and unattenuated signal. This process is repeated using a delay equal to the travel time of waves in the water layer beneath the seismic wave detector. The appropriate attenuation and time delay is determined by autocorrelation of traces produced by vertically traveling seismic waves at the ends of a geophone spread.

Keywords: Seismic record processor



NOVEMBER 12, 1968

3,410,097

PILE CAPPING MECHANISM

Edward M. Young, 90 Gregory Ave., West Orange, N.J. 07052

Filed Mar. 21, 1966, Ser. No. 536,022  
7 Claims. (Cl. 61—53)

A pile capping mechanism for rehabilitating the tops of old piles and also to provide concrete caps for new piles, the mechanism having a bottom member or portion of integral overlapping flexible fingers directed inwardly and angularly upwardly and of such length as to provide a central opening smaller than the pile and a casing extending from the bottom. The mechanism may provide U shaped side edges for the casing which are interengaged by contracting the casing and including internal braces when assembled to prevent inadvertent contraction of the casing and disengagement of the edges.

Keywords: Concrete form; Pile, wood; Structure repair

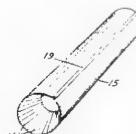


Figure 4. Typical annotations for original patents issued before 1969.

AUGUST 31, 1971

3,601,999

**METHODS OF GROUTING OFFSHORE STRUCTURES**  
Horace W. Olsen, 2038 North Blvd., Houston, Tex., and Max  
Bassett, P.O.Box 808 South, South Houston, Tex.  
Filed Sept. 18, 1969, Ser. No. 858,951  
Int. Cl. E02b 1/700; E02d 5/24

U.S. Cl. 61—46

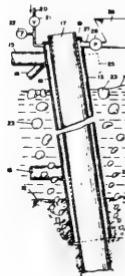
1 Claim

Compressed air is introduced into an annular space existing between the jacket and piling in the legs of an offshore structure, so that water is expelled from the annular space through the lower end of the jacket and grouting material is then introduced into the annular space. The introduction of compressed air and grouting material is effected from above the waterline, thus avoiding the necessity of performing the grouting operation by divers at the sea bed.

Keywords: Grouting; Offshore construction;  
Pile, structure connection

U.S. Cl. X.R. 61-54

See: Re. 28,232



3,602,000

**REINFORCED STEEL PIPE PILING STRUCTURE**  
Homayoun Joe Meheen, Box 515, Rte. 3, Golden, Colo.  
Continuation-in-part of application Ser. No. 712,187, Mar.  
11, 1968, now Patent No. 3,403,707, dated July 16, 1969.  
This application Sept. 19, 1969, Ser. No. 859,403  
Int. Cl. E02d 5/40, 5/58; E04e 3/34

U.S. Cl. 61—46

10 Claims

Reinforcement for steel pipe piles and piling structure such as that supporting an offshore oil platform, which has deteriorated and lost its strength. The pile is reinforced in situ by cutting an access opening into its interior, or cutting such an access opening through the pile to communicate with the interior of a steel bracing pipe in the structure, and introducing a partially prestressed and partially reinforced concrete column inside the steel shell.

Keywords: Offshore construction; Offshore platform, leg; Pile, concrete; Pile, steel; Structure repair

U.S. Cl. X.R. 52-223; 61-53; 61-53.52;  
61-56



Figure 5. Typical annotations for original patents issued since 1969.

3. 1973  
3,708,070 to 3,781,778

JANUARY 2, 1973

**3,708,070**

**OIL SKIMMER**

**Edwin A. Bell, Lake Charles, La., assignor to Cities Service Oil Co.**  
**Filed Oct. 2, 1970, Ser. No. 77,596**  
**Int. Cl. C02b 9/02**

**U.S. Cl. 210—242**

**6 Claims**

In order to recover surface oil from a body of water a floating oil skimmer barge is provided with a series of compartments, beginning at the prow of the barge, inflow to each compartment being effected over a respective floating baffle pivotally mounted at its bottom edge to swing into its compartment to a depth determined by the pressure differential across the baffle. Position of the baffle is controlled by pumping water at controlled rates from the bottom of the downstream end of each compartment to thereby cause an effective surface flow between compartments. Surface oil builds up in depth at the downstream end of the last compartment and is collected, substantially free of water, in a recovery chamber which is also provided with a floating baffle and from which oil is pumped at controllable rates.

**Keywords:** Pollutant collection; Pollutant removal watercraft; Pollutant, suction removal

**U.S. Cl. X.R. 210-DIG.21**



JANUARY 9, 1973

**3,708,982**

**SYSTEM AND BARRIER FOR CONTAINING AN OIL SPILL**

**Thomas Nicholas Blockwick, McLean, Va., assignor to Ocean Systems, Inc., New York, N.Y.**  
**Filed Oct. 21, 1970, Ser. No. 79,997**  
**Int. Cl. E02b 15/04**

**U.S. Cl. 61—1 F**

**23 Claims**

A system for containing an oil spill comprising a plurality of barrier modules each composed of a composite structure having a buoyant upper section and a water absorbing lower section which represents concurrently the sole ballast for said upper section and the subsurface barrier for the module.

**Keywords:** Pollutant, surface barrier

**U.S. Cl. X.R. 61-5; 114-.5F**

**See: Re. 28,966**

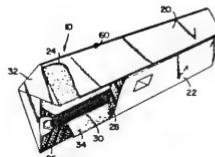


Figure 6. Additional examples of annotations for original patents.

4. Reissued Patents  
1974 to 1976  
Re. 28,232 to Re. 28,989

Note: Matter enclosed in heavy brackets [] appears in the original patent but forms no part of the reissued specification; matter printed in italics indicates the additions made by reissue.

Re. 28,232

METHODS OF GROUTING OFFSHORE  
STRUCTURES

Max Bassett, Houston, Tex., and Horace W. Olsen, deceased, late of Houston, Tex., by Magdalene M. Olsen, executrix, Houston, Tex., assignors to C. Nelson Shields, Jr., trustee  
Original No. 3,601,999, dated Aug. 31, 1971, Ser. No. 858,951, Sept. 18, 1969. Application for reissue July 11, 1973, Ser. No. 378,196  
Int. Cl. E02b 17/00; E02d 5/24

U.S. CL. 61—46 15 Claims

A method for grouting the annulus between the jacket and piling in the legs of an offshore structure in which air is introduced to expel water from the lower end of the annulus, and the annulus is then filled from the top with grouting material. Air pressure may be maintained in the annulus sufficient to prevent ingress of water through the lower end of the jacket while grouting material is being introduced.

[Compressed air is introduced into an annular space existing between the jacket and piling in the legs of an offshore structure so that water is expelled from the annular space through the lower end of the jacket and grouting material is then introduced into the annular space. The introduction of compressed air and grouting material is effected from above the water-line, thus avoiding the necessity of performing the grouting operation by divers at the sea bed.]

Reissued Nov. 5, 1974

Keywords: Grouting; Offshore construction;  
Pile, structure connection

U.S. CL. X.R. 61-53.52; 61-53.6; 61-54

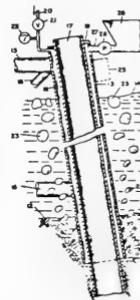


Figure 7. Typical annotations for reissued patents.

Re. 28,332

METHOD AND APPARATUS FOR PREVENTING  
ICE DAMAGE TO MARINE STRUCTURES

Joseph F. Schirtzinger, Pasadena, Calif., assignor to  
Sea-Log Corporation, Pasadena, Calif.

Original No. 3,669,052, dated June 13, 1972, Ser. No.  
46,273, June 15, 1970. Application for reissue Oct.  
25, 1973, Ser. No. 409,747

Int. Cl. B63b 35/08

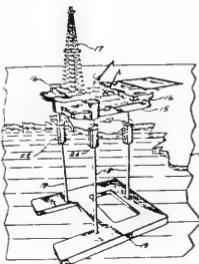
U.S. Cl. 114—5 R 15 Claims

A marine well drilling platform or the like having legs extending to the sea floor is protected from ice floes by comminuting devices at the water line for breaking the ice and thereby preventing crushing or overturning of the platform. The comminuting devices employ high velocity impacts against the ice to cause its fracture into chips as distinguished from cutting action. Rapidly rotating or reciprocating mechanisms with large "teeth" for making impact engagement with the ice are employed in separate embodiments. Comminuting devices mounted for sweeping adjacent a mooring buoy in one embodiment open a path through an ice floe for protecting the buoy and a ship moored at the buoy.

Reissued Feb. 11, 1975

Keywords: Ice protection; Offshore mooring structure; Offshore platform, fixed; Offshore platform, leg; Offshore structure fender

U.S. Cl. X.R. 9-8R; 61-1; 61-46; 114-42;  
299-24



Re. 28,966

SYSTEM AND BARRIER FOR CONTAINING AN OIL SPILL

Thomas Nicholas Blockwick, McLean, Va., assignor to Ocean Systems, Inc., Reston, Va.  
Original No. 3,708,982, dated Jan. 9, 1973, Ser. No. 79,997,  
Oct. 21, 1970. Application for reissue Jan. 24, 1974, Ser.  
No. 436,146

Int. Cl. E02b 15/04

U.S. Cl. 61—1 F 19 Claims

A system for containing an oil spill comprising a plurality of barrier modules each composed of a composite structure having a buoyant upper section and a water absorbing lower section which represents concurrently the sole ballast for said upper section and the subsurface barrier for the module.

Reissued Sept. 21, 1976

Keywords: Pollutant, surface barrier  
U.S. Cl. X.R. 61-5; 114-.5F; 210-83

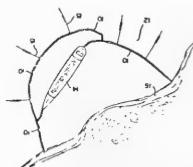


Figure from entry for original patent

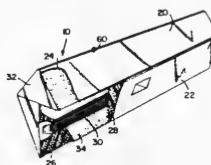


Figure 8. Additional examples of annotations for reissued patents.

presented with any deletions in brackets. Additions, ranging from single words to complete new abstracts, are in italics. The annotations for patent 3,601,999 at the top of Figure 5 and for its reissue, Re. 28,232, in Figure 7 demonstrate the way changes in the abstract are designated. The annotations for patent 3,708,982 at the bottom of Figure 6 and for its reissue, Re. 28,966 at the bottom of Figure 8 show how a change in illustrative figure is described.

Several original patents annotated in Volumes I or II were reissued during periods covered by the other volumes. Information on these reissued editions is included in Volumes I and II as the sections "Referenced Reissued Patents" and "Additional Referenced Reissued Patents," respectively. Figure 9 is the complete section from Volume II. The reissued patents described in these sections are not included in the indexes of their respective volumes. As can be seen from comparison of the notes on reissued patents Re. 28,232, Re. 28,332, and Re. 28,966 in Figure 9 to the annotations for these reissued patents in Figures 7 and 8, each entry includes, in a format similar to the annotations, information on the original patent, the application for reissue, the date of reissue, and the changes in the classification codes or keywords. If an abstract or figure was added or revised, the entry includes the new information.

## 2. Use of the Title List.

The list of titles and numbers in each volume, arranged in numerical order with reissued patents at the end of the list, may be used to determine whether a patent is in the collection when the patent number is available from an outside source. Figure 10 is an example page of the title list from Volume III. As an example of its use, assume that an article on floating breakwaters mentions a patent 3,991,576. As discussed above, this number falls in the range covered by Volume III. Refer to the title list in Volume III and find, as shown in Figure 10, that patent 3,991,576 is in the collection.

## 3. Use of the Subject Index.

The subject index in each volume is used to find patents related to a chosen topic. To enter the index, first find the keywords related to the topic by referring to the listing of keyword definitions in this report or in Section II of the first volume of the appendix. Next, search the subject index of each volume to find the lists of information on patents referenced to the selected keywords. Figures 11 and 12 are excerpts from the subject indexes of Volumes III and I, respectively. Notice that the number, title, and other assigned keywords are given for each patent. The other assigned keywords are included for their descriptive value to aid identification of the many patents with general titles, such as "Offshore Structure," or with titles using ill defined terms, such as "Jetty." To select interesting patents, examine the title and the other keywords for each patent listed under a chosen keyword; then, for the most promising patents, use the patent numbers to find the

## 5. Additional Referenced Reissued Patents.

The following reissued patents published between the end of 1973 and the end of 1976 are revisions of original patents in this volume. These reissued patents are not included in the annotations or subject index in this volume. Listed below are key information referencing the reissued patent to the original patent and new material added to or replacing information in this volume's annotation for the original patent. Complete annotations for these reissued patents are in the volume for the years the revisions were published.

**Re. 28,232**

### METHODS OF GROUTING OFFSHORE STRUCTURES

Max Bassett, Houston, Tex., and Horace W. Olsen, deceased, late of Houston, Tex., by Magdalene M. Olsen, executrix, Houston, Tex., assignors to C. Nelson Shields, Jr., trustee

Original No. 3,601,999, dated Aug. 31, 1971, Ser. No. 858,951, Sept. 18, 1969. Application for reissue July 11, 1973, Ser. No. 378,196

Int. Cl. E02b 17/00; E02d 5/24

U.S. Cl. 61—46

15 Claims

Reissued Nov. 5, 1974

Added U.S. Cl. X.R. 61-53.52; 61-53.6

A method for grouting the annulus between the jacket and piling in the legs of an offshore structure in which air is introduced to expel water from the lower end of the annulus, and the annulus is then filled from the top with grouting material. Air pressure may be maintained in the annulus sufficient to prevent ingress of water through the lower end of the jacket while grouting material is being introduced.

[Compressed air is introduced into an annular space existing between the jacket and piling in the legs of an offshore structure so that water is expelled from the annular space through the lower end of the jacket and grouting material is then introduced into the annular space. The introduction of compressed air and grouting material is effected from above the water-line, thus avoiding the necessity of performing the grouting operation by divers at the sea bed.]

**Re. 28,332**

### METHOD AND APPARATUS FOR PREVENTING ICE DAMAGE TO MARINE STRUCTURES

Joseph F. Schirtzinger, Pasadena, Calif., assignor to Sea-Log Corporation, Pasadena, Calif.

Original No. 3,669,052, dated June 13, 1972, Ser. No. 46,273, June 15, 1970. Application for reissue Oct. 25, 1973, Ser. No. 409,747

Int. Cl. B63b 35/08

U.S. Cl. 114—5 R

15 Claims

Reissued Feb. 11, 1975

Added Keyword: Offshore platform, leg

**Re. 28,966**

### SYSTEM AND BARRIER FOR CONTAINING AN OIL SPILL

Thomas Nicholas Blockwick, McLean, Va., assignor to Ocean Systems, Inc., Reston, Va.

Original No. 3,708,982, dated Jan. 9, 1973, Ser. No. 79,997, Oct. 21, 1970. Application for reissue Jan. 24, 1974, Ser. No. 436,146

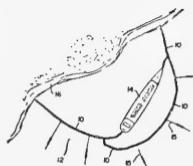
Int. Cl. E02b 15/04

U.S. Cl. 61—1 F

19 Claims

Reissued Sept. 21, 1976

Added U.S. Cl. X.R. 210-83



**Re. 28,989**

### ELECTROMAGNETIC WATER CURRENT METER

Vincent J. Cushing, 9804 Hillridge Drive, Kensington, Md. 20795

Original No. 3,759,097, dated Sept. 18, 1973, Ser. No. 68,674, Sept. 1, 1970. Application for reissue Dec. 10, 1974, Ser. No. 531,418

Int. Cl. G01F 1/58

U.S. Cl. 73—194 EM

22 Claims

Reissued Oct. 5, 1976

Figure 9. Notes on some of the reissued editions of original patents annotated in Volume II.

3989951 WAVE ENERGY POWER GENERATING BREAKWATER  
3990034 TOWABLE VLF SONAR PROJECTOR  
3990247 SYSTEM OF STRUCTURES TO RESIST HYDRODYNAMIC FORCES  
3990252 EARTHWORKS CONSOLIDATION SYSTEM  
3990253 METHOD FOR CONSTRUCTING AN ICE PLATFORM  
3990254 MARINE STRUCTURE FOR OFFSHORE ACTIVITIES  
3990377 SELF-PROPELLED MACHINE FOR SEA-BED WORK  
3990379 DREDGING APPARATUS  
3990386 FAIRED MULTI-STRENGTH MEMBER TOWCABLE AND ASSOCIATED SEQUENTIAL LOAD DISTRIBUTION SYSTEM  
3990970 ABSORBENT PRODUCTS FOR HYDROCARBONS  
3990975 RIGGING SYSTEM FOR AN ENDLESS OIL MOP  
3991563 HYDROELECTRIC POWER PLANT  
3991576 FLOATING BREAKWATER  
3991581 METHOD AND APPARATUS FOR HANDLING PILING AND ANCHORING AN OFFSHORE TOWER  
3991582 ROTATING-BUMPER FENDER SYSTEM  
3991623 MARINE INSTRUMENT  
3991695 WATERCRAFT DOCKING  
3992105 METHOD AND APPARATUS FOR REMOTE SALINITY SENSING  
3992272 SUBMERGED OFFSHORE PLATFORM JOINT PROTECTION  
3992292 MOVING BELT-TYPE OIL SPILLER WITH PROPULSION INDUCED FLOW,  
METHOD AND APPARATUS  
3992735 FLOTATION RING FOR DREDGE PIPE LINES  
3992737 SUSPENSION SYSTEM FOR UNDERWATER EQUIPMENT  
3992881 APPARATUS TO GENERATE HIGH PRESSURE AIR FROM WATER  
3993913 TIDEWATER POWER SYSTEM  
3994082 AIR OPERATED DREDGING APPARATUS  
3994134 APPARATUS FOR POWER GENERATION IN DEEP SEAWATER  
3994629 MECHANISM FOR TAPPING THE SURF ENERGY  
3994795 SACRIFICIAL ANODE  
3995160 METHOD AND APPARATUS FOR OBTAINING ELECTRICAL POWER FROM SEA WATER  
3995434 WAVE DISSIPATING WALL  
3995437 SHOCK ABSORBING ARRANGEMENT FOR A MARINE STRUCTURE  
3995438 METHOD FOR INCREASING THE LOAD CARRYING CAPACITY  
AND FULL-OUT RESISTANCE OF HOLLOW PILES  
3995439 DEVICE FOR EMBEDDING OBJECTS SUCH AS CONTINUOUS PIPES INTO WATER BOTTOMS  
3995480 THERMAL SENSOR FOR MEASUREMENT OF OCEAN CURRENT DIRECTION  
3996134 METHOD OF DISPERSING OIL IN WATER  
3996138 MARINE LIFE PROTECTOR  
3996678 FREE-FALL GRAB  
3996754 MOBILE MARINE DRILLING UNIT  
3996756 METHOD AND APPARATUS FOR SUPPORTING A DRILLING PLATFORM  
ON THE OCEAN FLOOR  
3996757 APPARATUS FOR PROTECTING METALLIC STRUCTURAL ELEMENTS AGAINST CORROSION  
3996794 DIFFERENTIAL DEPTH INDICATOR  
3996876 MARINE LINE SECURING APPARATUS  
3997022 DEVICE FOR GENERATING ACOUSTIC WAVES BY IMPLOSION  
3998060 BARRIER FOR WATER CARRIED POLLUTANTS  
3998061 FORMATION OF CAVITIES IN THE BED OF A SHEET OF WATER  
3998062 SEA FLOOR SUPPORTED STRUCTURES WITH CRUSHABLE SUPPORT  
3998063 METHOD AND APPARATUS FOR REMOVING CONSTRUCTION PILES  
3998064 SURACQUEOUS PILE DRIVING APPARATUS AND METHOD  
3996733 DETERGENT COMPOSITION FOR DISPERSING OIL SPILLS  
3999312 WATER JET TYPE UNDERWATER GROUND EXCAVATOR  
3999313 TOWER SLID FOR DEEP-SEA PARTICLE HARVEST  
3999395 SUPPORT ARRANGEMENT FOR A CONSTRUCTION  
3999397 MODULAR DOCK SYSTEM  
3999399 PROTECTIVE GUARD MEANS FOR WOOD PILING AND A METHOD  
OF INSTALLING SAME UNDER DRY WORKING CONDITIONS  
3999497 SHOCK-ABSORBING BUFFER FOR BOARDING FENDER  
3999566 METHOD AND APPARATUS FOR DISCHARGING OVERBOARD EXCESS WATER  
FROM HOPPER OF HOPPER SUCTION DREDGER OR BARGE OR SCOW  
RE28232 METHODS OF GROUTING OFFSHORE STRUCTURES  
RE28332 METHOD AND APPARATUS FOR PREVENTING ICE DAMAGE TO MARINE STRUCTURES

Figure 10. Page from title list of Volume III.

3984989 MEANS FOR PRODUCING SUBAQUEOUS AND OTHER CAST-IN-PLACE CONCRETE  
STRUCTURES IN SITU. OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ;  
OFFSHORE CONSTRUCTION ; PILE, CONCRETE ; SEAWALL ; STRUCTURE REPAIR

**BREAKWATER, FLOATING**

3785159 ATTENUATION OF WATER WAVES AND CONTROL AND UTILIZATION  
OF WAVE-INDUCED WATER MOVEMENTS. OTHER KEYWORDS:  
BREAKWATER, STEEL FRAME ; POLLUTANT COLLECTION ; POLLUTANT DISPERSION ;  
POLLUTANT, SURFACE BARRIER ; POWER, WAVE

3791150 FLOATING BREAKWATER FOR ATTENUATING SEAS

3800543 OFFSET BREAKWATER CONFIGURATION

3846990 FLOATING WAVE BARRIER  
OTHER KEYWORDS: BUOY MOORING SYSTEM

3848419 FLOATING WAVE BARRIER  
OTHER KEYWORDS: BUOY MOORING SYSTEM

3863455 FLOATABLE BREAKWATER

3864920 FLOATING BREAKWATER

3877233 FLOATING BREAKWATER SYSTEM  
OTHER KEYWORDS: LOW-COST SHORE PROTECTION

3884042 FLOATING BREAKWATER  
OTHER KEYWORDS: LOW-COST SHORE PROTECTION ; TIRES

3908384 BREAKWATERS FOR LONG, SHORT AND/OR COMPLEX WATER WAVES  
OTHER KEYWORDS: BREAKWATER, STEEL FRAME

3952521 PORTABLE FLOATING WAVE TRIPPER  
OTHER KEYWORDS: BREAKWATER, STEEL FRAME

3953977 DEVICE FOR DAMPING WAVES  
OTHER KEYWORDS: BREAKWATER, STEEL FRAME ; TIRES

3969901 FLOATING BREAKWATERS

3971221 BREAKWATER SYSTEM FOR CREATING ARTIFICIAL SANDBARS  
OTHER KEYWORDS: BAR PROTECTION

3991576 FLOATING BREAKWATER

**BREAKWATER, PNEUMATIC**

3803849 METHOD AND APPARATUS FOR DAMPING WAVE ACTION

3822555 MARINA PROTECTIVE WAVE BREAKER

**BREAKWATER, STEEL FRAME**

3785159 ATTENUATION OF WATER WAVES AND CONTROL AND UTILIZATION  
OF WAVE-INDUCED WATER MOVEMENTS. OTHER KEYWORDS:  
BREAKWATER, FLOATING ; POLLUTANT COLLECTION ; POLLUTANT DISPERSION ;  
POLLUTANT, SURFACE BARRIER ; POWER, WAVE

3835651 LITTORAL FLOW TRAP OR BASIN  
OTHER KEYWORDS: BULKHEAD ; GROIN ; SEAWALL

Figure 11. Page from subject index of Volume III.

*PILE, WOOD*

- 3295332 *PROTECTIVE COVER FOR BUTT ENDS OF TIMBER PILES*  
OTHER KEYWORDS: CONCRETE FORM ; PILE PROTECTION
- 3306054 *SKIRT TYPE PILE DRIVING POINT*  
OTHER KEYWORDS: PILE-DRIVING SHOE ; PILE, STEEL
- 3307362 *POSTING PILING*  
OTHER KEYWORDS: PILE SECTION CONNECTION ; STRUCTURE REPAIR
- 3321924 *PROTECTION OF SUBMERGED PILING*  
OTHER KEYWORDS: COATING ; PILE PROTECTION ; WOOD PRESERVATIVE
- 3331211 *PILE INSPECTION AND REPAIR CELL*  
OTHER KEYWORDS: PILE, CONCRETE ; STRUCTURE INSPECTION ;  
STRUCTURE REPAIR
- 3333427 *BOOT FOR PILOT TIMBER PILE*  
OTHER KEYWORDS: PILE-DRIVING SHOE
- 3338058 *ADJUSTABLE COMPOSITE FORM*  
OTHER KEYWORDS: CONCRETE FORM ; PILE, CONCRETE ; PILE, STEEL ;  
STRUCTURE REPAIR
- 3377808 *CAP ASSEMBLY FOR PILE SHELL*  
OTHER KEYWORDS: CONCRETE FORM ; PILE, STRUCTURE CONNECTION ;  
STRUCTURE REPAIR
- 3379020 *DOLPHIN OR MARINE CONSTRUCTION*  
OTHER KEYWORDS: COLLISION PROTECTION ; OFFSHORE CONSTRUCTION ;  
PILE DOLPHIN
- 3410097 *PILE CAPPING MECHANISM*  
OTHER KEYWORDS: CONCRETE FORM ; STRUCTURE REPAIR
- 3426585 *ULTRASONIC SYSTEM FOR INSPECTING SUBMERGED PILES*  
OTHER KEYWORDS: PILE, STEEL ; STRUCTURE INSPECTION
- 3448585 *POLE AND PILE PROTECTOR*  
OTHER KEYWORDS: COATING ; ICE PROTECTION ; PILE PROTECTION
- 3505825 *SYSTEM FOR REPLACING DETERIORATED WOOD PILING*  
OTHER KEYWORDS: CONCRETE FORM ; PILE, CONCRETE ; STRUCTURE REPAIR
- 3514959 *PEDESTAL TIMBER PILE SHOE*  
OTHER KEYWORDS: PILE-DRIVING SHOE

Figure 12. Page from subject index of Volume I.

annotations in the bibliography. Once a desirable patent has been found through inspection of the indexes or annotations, the other keywords for the patent may be used as guides to further searching in the subject index.

If information is needed on patents for floating breakwaters, for example, two approaches may be taken. In the first case, if no numbers for patents on floating breakwaters are known, the list of keyword definitions must be used to find at least one applicable keyword such as "Breakwater, floating." Next, the list of patents referenced to that keyword is located in a volume, as shown in Figure 11 for Volume III. Inspection of Figure 11 reveals that some of the patents have "Floating Breakwater" or something similar for a title and have only "Breakwater, floating" as a keyword. For that type of patent, exemplified by patent 3,991,576, the determination of the usefulness of the patent will require examination of the bibliography annotation or of the patent itself. The annotation for patent 3,991,576 is presented at the top of Figure 13 for comparison with the subject index information listed in Figure 11 and with the front page of the patent shown in Figure 1. In the second case, if the number for a floating breakwater patent is known and can be found in a title list, as was demonstrated for patent 3,991,576, then keywords can be taken directly from the patent's annotation and used for searching in the subject index with the confidence that the keywords apply to the type of patents desired.

Combinations of keywords may be used to identify distinct types of patents in the subject indexes. If patents on methods of repairing wood piles are desired, the keywords "Pile, wood" and "Structure repair" can be used together to pick out those patents. Figure 12 includes the list of patents referenced to "Pile, wood" in Volume I. Notice that most of the titles, like "Posting Piling," do not mention the type of piling involved in the patent. If methods of replacing a section of pile with concrete are desired, look for the keyword "Concrete form." Patent 3,410,097, with its annotation illustrated at the bottom of Figure 4, is an example. For methods of joining wood replacement sections to existing piles, look for "Pile section connection" in the absence of keywords mentioning concrete or steel. Patent 3,307,362, annotated at the bottom of Figure 14, is an example of a patent with this combination of keywords. Successful use of combinations of keywords requires close inspection of the keyword definitions and of the keywords assigned to patents of known value, plus experience in using the subject index.

Searches for patents issued before 1967 or after 1976 can be aided by the use of the classification information in the annotations. For a particular coastal engineering topic, classification codes corresponding to the topic or a keyword might be found by using the methods outlined above to select related patents in the CERC collection, then recording the classification codes common to all or most of the chosen patents. As discussed previously, the classification codes or lists of patents classified under the codes may be used as a guide to searching a patent

3,991,576

FLOATING BREAKWATER

Sandanori Tazaki, Kodairo, and Yozo Ishida, Kunitachi, both of Japan, assignors to Bridgestone Tire Company Limited, Tokyo, Japan

Division of Ser. No. 398,368, Sept. 18, 1973. This application

Dec. 27, 1974, Ser. No. 536,783

Claims priority, application Japan, Sept. 19, 1972, 47-107980; Sept. 30, 1972, 47-113640; May 9, 1973, 48-54312

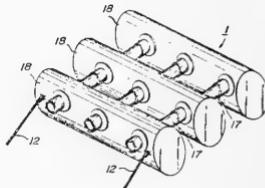
Int. Cl.<sup>2</sup> E02B 3/06

U.S. CL. 61—5

1 Claim

A floating breakwater in which the floating body is formed by housing a floating material as a floating source and a weighting material as a source for increasing weight in a hollow shell composed of a rigid material and provided with a projection on the upper portion. The specific gravity of the floating body is made to be 0.15 – 0.75 owing to the floating material and the weighting material.

Keywords: Breakwater, floating



3,991,581

METHOD AND APPARATUS FOR HANDLING PILING  
AND ANCHORING AN OFFSHORE TOWER

Alfred Reeves Kolb, Corleston on Sea, England, assignor to Brown & Root, Inc., Houston, Tex.

Filed June 2, 1975, Ser. No. 582,677

Int. Cl.<sup>2</sup> E02B 17/00

U.S. CL. 61—53.5

10 Claims

**A method and apparatus for handling piling and anchoring an offshore tower** are disclosed wherein sudden loading of a derrick handling the piling is avoided as the piling is moved into position preparatory to driving. The apparatus entails a base intended to rest upon an upper end of a piling guide. A releasable gripping means is connected to the base and serves to grip and restrain an add-on piling while the add-on piling is connected to a piling connected and thus suspended within the piling guide and also while the suspended piling is released therefrom. Releasing means are employed to release the gripping means to permit concurrent downward movement of the add-on and suspended piling.

In further aspects, the apparatus and method of the invention effect the connection of an add-on piling to a piling suspended from an offshore tower by first at least partially enclosing the add-on piling within a chuck releasably gripping the add-on piling. The add-on and chuck are next hung from the boom of a floating derrick and the add-on piling is connected to the suspended piling. The piling is thereafter disconnected from the piling guide while the suspension thereof is concurrently maintained by a restraining engagement between the chuck and the piling guide. Ultimately the piling is lowered and forced into the strata underlying the floor of the body of water.

Keywords: Offshore platform, fixed; Offshore platform, leg; Pile placement; Pile section connection

U.S. CL. X.R. 61-86

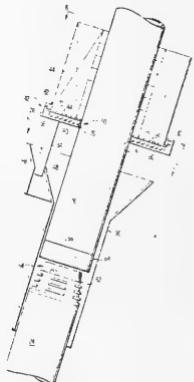


Figure 13. Annotations illustrating assignment of keywords.

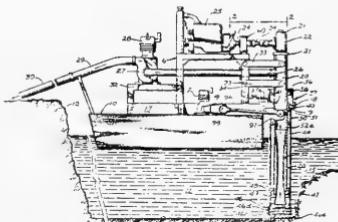
MARCH 7, 1967

3,307,278

**SONIC DREDGING PROCESS AND APPARATUS**  
Albert G. Bodine, Jr., 7877 Woodley Ave.,  
Los Angeles, Calif. 91406  
Filed Nov. 24, 1964, Ser. No. 413,495  
21 Claims. (Cl. 37—195)

1. In a sonic apparatus for dredging earth material from the earthen bottom of a body of water, the combination of:
- a dredge tube extending downwardly to a position adjacent to said earthen bottom,
  - a resonant sonic vibration radiator at the lower end of said dredge tube for stirring up earthen material at said bottom and bringing it into suspension in the water so as to form a slurry adjacent said lower end of said dredge tube,
  - a resonant elastic vibration system vibratory coupled to said radiator,
  - sonic generating means for driving said sonic wave radiator, said generating means being operable at a frequency which will produce sonic wave vibration, and
  - means for circulating said slurry up said dredge tube.

Keywords: Dredge, cutterhead; Dredge, suction



collection. This method cannot be used if the patents in the CERC collection have been reclassified since they were issued. For instance, in January 1979, the class code for "Hydraulic and Earth Engineering," the class containing most shore protection and harbor structures, was changed from 61 to 405 with corresponding changes in all of the subclass codes. Table 4 gives all the new codes for the class. Currently, all of the patents in the coastal engineering collection assigned class code 61 would be found in a library collection filed under class code 405 with their subclass codes altered according to the differences between Figure 2 and Table 4.

## VII. SUMMARY

Patents contain information valuable to designers, inventors, and researchers working in the coastal engineering field, but the size and complexity of the Patent Office collection have hindered the widespread use of patents as reference sources. The CERC patent collection and its search aids make a part of the Patent Office collection more accessible to technical personnel. The search aids include:

1. The patent number and title lists which are used to determine whether a patent is in the collection;
2. the subject indexes which are used to identify patents involving specific topics;
3. the detailed set of keyword definitions which describe how topics are grouped together in the subject indexes;
4. the annotations which present information on the invention, inventor, assignee, application and patent documents, classification codes and keywords; and
5. the instructions on locating and examining copies of patents.

In some cases the search aids may be used to link the keywords of the CERC collection to the classification codes of the Patent Office collection, simplifying the identification of useful patents issued outside the time period covered by the CERC collection and improving the usefulness of the whole patent collection.

Table 4. Revised codes for "Hydraulic and Earth Engineering" from the *Manual of Classification of Patents*.

CLASS 405 HYDRAULIC AND EARTH ENGINEERING

JANUARY 1979

1	MARINE VESSEL PORTAGE, LAUNCHING, OR REMOVING	66	...With barrier storage or deployment feature
2	.Rail mounted carrier	67	...Quick release float
3	.Lifting	68	...Inflatable or deflatable
4	.Dry dock	69	...Self-inflating
5	..Fabrication	70	...Having joint detail
6	..Gate	71	...Having hinged joint between rigid sections
7	..Vessel support (e.g., bilge or keel block)	72	...With reinforcing feature
8	PRESSURIZED CAISSON	73	Erosive scouring
9	.Having lifting cable	74	Settling of suspended matter or removal of settled matter
10	..Movable relative to mobile support	75	Extracting power from moving fluid
11	MEANS TO EXPOSE A NORMALLY WETTED SURFACE, E.G., COFFERDAM, ETC.	75	Wave or tide
12	.Contoured to wetted surface, e.g., side hung ship caisson	77	With flow restrictor or ramp
13	.Having transport placement, or dislodgement means	79	Associated with dam
14	.Connectable sections	80	Wave generation or enhancement
15	BANK, SHORE, OR BED PROTECTION	82	Flow control
16	.Revetment	83	Fishway
17	..Revetment laying	84	Elevator
18	..Continuous concrete or concrete filled bag	85	Closed channel
19	..Mattress	86	Navigable canal
20	..Hinged concrete sections	87	Having lock
21	..Wave or flow dissipation	88	Movable lifting member
22	..Fluid application	89	Water gate or adjustable weir
23	..Floatable dissipator submerged at site	90	Center flow
24	..Artificial seaweed	91	Uniform discharge
25	..Bed supported subsurface dissipator	92	Removable
26	..Floating	93	Flexible
27	..Openwork	94	Condition responsive
28	..Flexibly suspended from or pivoted to support	95	To weight of liquid separated from a main body
29	..Polyprop	96	To pressure on pivoted water gate
30	..Openwork or concave face	97	With latch for closed position
31	..Associated with solid wall	98	Floating
32	..With fabric	99	Having separate float chamber
33	..Interfitted or interleaved members	100	Roller or flexible
34	..Jetty	101	Swinging
35	..Spaced members	102	About horizontal axis
36	DRAINAGE OR IRRIGATION	104	Overflow
37	.Control means responsive to sensed condition	105	Collapsible
38	.Including subsurface moisture barrier	106	Sliding
39	.Having regulation of flow through channel	107	Vertical
40	..At outlet or intake	108	Gate unseating
41	..Riser or standpipe outlet or intake	109	With lift mechanism or latch
42	..End cap	110	Artificial water barrier (e.g., dam, levee, etc.)
43	..Poros or apertured pipe, flume, or tiley	111	Having spillway
44	..Uniform discharge	112	Having impervious core
45	..Poros	113	Hollow or buttressed
46	..Earthen bottom	114	With ballast compartment or cavity
47	..Flow through joint	115	Vertical wall buttress
48	..Open seam or shielded outlet	116	Tension stayed
49	..Corrugated	117	Connectable sections
50	..Porous waterway, e.g., sand drain, etc.	118	Flexible
51	..Branched flow	119	In situ construction
52	FLUID CONTROL OR TREATMENT	120	Earthen
53	..Fluid storage in earthen cavity	121	Open channel
54	..With indicator or alarm means	122	Flume
55	..Cavity construction	123	Elbow or tee
56	..Including cooling or heating of material surrounding cavity	124	Joint
57	..Earth treatment	125	Including U-clamp
58	..Dissolving earth	126	With crossbar
59	..Supply or recovery of stored fluid by separate fluid	127	Culvert
60	..Floatable matter control	128	Terminal or head
61	..Ice	129	Serially connected segments
62	..Barrier formed by fluid	130	Intake
63	..Floating barrier	131	WATER DISPOSAL IN SOIL
64	..Submergible	132	Landfill
65	..With means to seal space between barrier and fixed structure	133	TEMPERATURE MODIFICATION OR CONTROL OF EARTHEN FORMATION
		134	Heating
		135	UNDERGROUND PASSAGEWAY, E.G., TUNNEL
		136	Vertical
		137	Sectional
			Seal or joint
			Subaqueous
			Below bed

Table 4. Revised codes for "Hydraulic and Earth Engineering" from the Manual of Classification of Patents.--Continued

CLASS 405 HYDRAULIC AND EARTH ENGINEERING

JANUARY 1979

138	UNDERGROUND PASSAGEWAY, E.G., TUNNEL	189	..With communication between inhabitable enclosures
139	.Boring	190	.Remote control
140	..With auxiliary tunnel	191	..From surface
141	..By axially overlapped members	192	..With air lock
142	..Shield	193	..With pressure equalization
	...With transverse force application feature	194	..With continuous surface access
143	..Direction control	195	MARINE STRUCTURE OR FABRICATION THEREOF
144	..Door or bulkhead	196	..With work deck vertically adjustable relative to floor
145	..Discrete independently advanceable earth supporting segments	197	..Sectionalized
146	..Lining installation	198	..Longitudinally extending projections or recesses
147	..Seal	199	..Frictional gripper
148	..Work platform	200	..By buoyancy control
149	Cut and cover	201	..With horizontally movable work deck
150	Lining	202	..With pivotal connection between work deck and base
151	..Panel	203	..Floatable to site and supported by marine floor
152	..With sealing feature	204	..With assembly of sectional supporting structure at site
153	...With separate fastening means between adjacent panels	205	..With ballasting means to sink or position structure at site
154	PIPE OR CABLE LAYING, RETRIEVING, OR UNDERWATER MANIPULATION	206	..Detachable from structure
155	.Cast in situ	207	..Compartment in base
156	..With forming or cutting of pipe or cable	208	...And leg depending from base
157	..With protection or indication of pipe or trench	209	..Separable transport means
158	..Submerging, raising, or manipulating line of pipe or cable in or from marine environment	210	..Storage container
159	..Entrenched or buried	211	..Structure protection
160	...Condition response	212	..Fender
161	..Extracting or burying apparatus guided by pre-positioned pipe or cable	213	..Tether type
162	...With apparatus buoyancy control	214	..Having coil spring
163	..With bottom fluidizing means	215	..Resilient block
164	...By towing submerged sled with attached plow and pipe or cable guide	216	..Sleeve or coating
	...With means to forcibly feed or to control tension in pipe or cable	217	..In or on frozen media
165	..Facilitated by extension from line-laying vessel	218	..Dock
166	..Articulated segments	219	..Floating
167	..With causing or controlling the deformation of a line	220	..Hinged
168	..With assembling of line structure	221	..Vertically adjustable
169	..Joining successive sections of line	222	..Cast in situ
170	..By control of buoyancy	223	..Installing means
171	..With anchoring or line	224	..With anchoring of structure to marine floor
172	..With raising of line from marine floor	225	..By grouting preformed structure
173	..By means advancing along terrain and guiding pipe or cable into subterranean position	226	..Including floor modifying means
174	..Condition responsive	227	..By pile extending through sleeve in structure
175	..Tape or strip	228	..Pile driving
176	..With positive feed or means to vary tension in pipe or cable	229	FOUNDATION
177	..Simultaneous laying of plural parallel pipes or cables	230	..Underpinning
178	..With backfill or bedding material conveying or dispensing means	231	..Columnar structure (e.g., pier, pile)
179	..Including trench forming plow with pipe or cable guide	232	..Pipes or apparatus for installing
180	..With depth adjustment	233	..Casting in situ hardenable fluent material
181	..With plow vibrating or oscillating means	234	...With heating, cooling, or explosion
182	..Guide integral with or rigidly fixed to plow	235	...With subsequent moving
183	..Advancing subterranean length of pipe or cable	236	...Subsurface dispensing of material for flow toward surface
184	DIVING	237	...Forming subsurface enlargement
185	.Suit or accessory therefor	238	...Preformed enlargement cavity
186	..Rigid element	239	...Providing embedded metallic reinforcement
187	..Underwater docking or mooring	240	...Dispensing fluent material while withdrawing dispenser
188		241	....Dispensing auger
		242	....Driven dispenser with separable tip
		243	....Withdrawing form structure
		244	...With anchoring of structure
		245	...Driving removable wall supporting core
		246	...Electrically retractable core
		247	...Fluid pressure actuated
		248	...With subsurface fluid discharge
		249	..Caisson or hollow shaft
		250	..Comprising series of connected longitudinal sections having diverse compositions

Table 4. Revised codes for "Hydraulic and Earth Engineering" from the Manual of Classification of Patents.--Continued

CLASS 405 HYDRAULIC AND EARTH ENGINEERING

JANUARY 1979

FOUNDATION	
251	.Columnar structure (e.g., pier, pile)
	..With joint or connection between sections of similar material
252	...Between concrete sections
253	..With driving or cutting tip
254	...Longitudinally ribbed
255	..With end cap
256	...Concrete
257	..With form or casing
258	EARTH TREATMENT OR CONTROL
259	.Rock or earth bolt or anchor
260	..With grouting feature
261	...Breaking canister or packet
262	..With retaining wall
263	.Chemical
264	..Organic
265	..Bituminous
266	.Cementitious (e.g., grouting)
267	..Filling subterranean cavity (e.g., underground wall)
268	...Lining
269	...Injector
270	.Impermeabilization
271	.Compaction
272	.Shoring, bracing, or cave-in prevention
273	..Cribbing
274	..Sheet piles
275	..Concrete
276	..Metal
277	....C or I sections
278	....Head and claw interlock
279	....With separate fastening, reinforcing or sealing means
280	....Cellular
281	....Bulb and socket interlock
282	....Trench shoring
283	....Shield type
284	....Retaining wall
285	....Pile and panel
286	....Concrete
287	....Cast in situ
288	....Roof support
289	....Inflatable
290	....Jack
291	....Mobile
292	....Position restoring
293	....With canopy extension
294	....Telescoping
295	....Cantilevered
296	....With rubble shield
297	....With contour following feature
298	....Under load advanceable
299	....Self-advanceable
300	....Paired
301	.....Nested
302	....Control system
303	MISCELLANEOUS



Ray, Robert E.

An annotated bibliography of patents related to coastal engineering / by Robert E. Ray, Michael D. Dickey, and Annie M. Lyles. - Fort Belvoir, Va. : U.S. Coastal Engineering Research Center ; Springfield, Va. : available from National Technical Information Service, 1979. 47 p. : ill. ; 27 cm. - (Miscellaneous report ; no. 79-6)

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